deal with this issue. The plan, developed in response to the National Invasive Species Act of 1996, provides the framework for a comprehensive state program to address the problems caused by invasive nuisance species. The scope of the activities are broad and aimed at preventing new introductions, controlling the spread of existing populations, and implementing abatement strategies to safeguard public health and the environment.

Specific initiatives involving exotics include development of ballast water management practices and standards, development of a rapid response initiative, a dispersal barrier project, and control of intentional introductions. These initiatives are designed to keep exotics from entering the Great Lakes ecosystem.

Chapter 6: Wetlands

In December 2000, the Wisconsin Department of Natural Resources Wetland Team developed *Reversing the Loss – A Strategy for Protecting and Restoring Wetlands in Wisconsin.* The Strategy charts a course for current and future Department policies and programs involved in wetland education, protection, restoration, enhancement and management. It established four major goals and performance measures to accomplish those goals by the year 2007. We are in the middle of implementing the Strategy and have made substantial progress in meeting some of the performance measures, however, there are also limitations to accomplishing others. Progress over the last two years on those goals and performance measures is described below:

"Reversing the Loss" – the Wetland Strategy

Goal 1 Strengthen relationships with property owners, nonprofit conservation organizations and local governments

Over 75 percent of the state's wetlands (over 4 million acres) are in private ownership. The department will need to enlist wetland owners, nonprofit conservation organizations and local governments in preserving and restoring wetlands on private property while sustaining agriculture, forestry, recreation and other wetland uses including development when compatible with wetland health. An established dialogue with wetland owners, and focused outreach, education and incentives along with technical assistance, will be necessary components to make this strategy work.

Goal 1 Performance Measure: Public Outreach

Wetland Restoration Handbook for Wisconsin Landowners, 2nd Edition

The second edition of the Wetland Restoration Handbook for Wisconsin Landowners has recently been published by the DNR's Bureau of Integrated Science Services. The handbook is a collaboration between the DNR and the Wisconsin Wetlands Association, a nonprofit organization. The handbook describes the fundamentals of wetland restoration in an interesting way. New chapters that have been added since the first edition include seeding and planting considerations, invasive species control information, wetland management recommendations, additional photographs and enhanced graphics. There is an expanded reference section of useful internet web sites, flora and fauna guides and a new statewide contact list.

Restoration workshops

Wisconsin Wetlands Association and Wisconsin Waterfowl Association held wetland restoration workshops with assistance from a US Fish and Wildlife Service grant in collaboration with DNR. These workshops were geared toward landowners and land managers interested in restoring their own wetlands.

Wetlands Internet Web Site

DNR continues to update the Wetlands web page as new information of interest becomes available. Some of the most significant changes include the addition of a Wetlands Mitigation page and

Assessment and Monitoring page. Also, our What's New page updates the public on recent events, laws and new publications. The DNR's Wetland Web address is: http://dnr.wi.gov/org/water/fhp/wetlands/index.shtml.

Guidance and Policy

The Wetland Team continues to develop guidance and policy, as necessary. Administrative codes have been developed to establish standards for compensatory mitigation and to simplify the approval process for wetland conservation activities.

Wetland Restoration, Management and Protection

DNR staff continue to work with the public and other government agency staff to provide technical assistance on wetland restoration, management and protection.

Wetland Educational Publications

Informational materials both for the general public and focused on a selected group have been developed and are being distributed. Examples *include Midwestern Ephemeral Wetlands, A Vanishing Habitat* and *Guidelines for Wetland Compensatory Mitigation In Wisconsin.* There has been a great demand for these informational publications.

Regulatory Workshops

A conference was held with local road advocates and key stakeholder groups to discuss streamlining the regulatory process for those projects. Meetings have been held with various energy industry groups to develop methods and techniques for wetland avoidance and minimization of impacts from energy projects.

Training Sessions

Wetland delineation, ecological assessment and plant identification training conducted by DNR staff and an interagency group is a continuing process. Training for both the public (consultants and individuals) and agency staff are offered. Two Regulatory IV sessions were held for agency staff. Trainers included WDNR, Southeastern Wisconsin Regional Planning Agency, US Geological Survey, US Army Corps of Engineers and Natural Resources Conservation Service staff.

Wetland Compensatory Mitigation Workshop

The Department sought and received an USEPA grant to cover costs associated with a web-site and several powerpoint presentations. A full-day workshop for over 70 consultants involved in wetland regulatory work and wetland mitigation was held in April 2003. With limited Department staffing for the program, we felt it was key to provide very detailed training to the consultants that handle this type of work. Since April, the quality of submittals has improved noticeably.

In addition, Department staff have sought and taken many opportunities to present information at existing industry group forums over the last two years including three different Wisconsin Realtors Association events, the Milwaukee Builders Association, the Milwaukee Bar Association, the League of Municipalities, meetings of consulting engineers groups, and the Solid Waste Technical Advisory committee.

Incentives

The Department has developed a landowner's guide to property assessment, provided information and testimony to the state Legislature on "use value assessment" legislation which has passed and resulted in wetlands to be taxed at 50% of assessed value. We are currently developing a guide explaining the legislation and how it will impact the landscape and a report on other state and province tax policy and incentive programs which will include a recommendation for a Wisconsin program.

Goal 2: Manage wetlands to protect diversity of species, wildlife health, and ecological integrity

Wetlands are naturally productive and interspersed among our state's aquatic and terrestrial

communities. Because protecting, restoring and enhancing wetlands contributes significantly to the ecological health of other biological communities, wetland communities should be a focus when managing Wisconsin's biodiversity. Wildlife that depends on water — everything from water fleas to mink to osprey — require adequate habitat and protection from ecosystem contaminants. Establishing a system of connected aquatic and terrestrial features for each eco-region will help target resources and activities on areas with the highest ecological potential. Acquiring exceptionally high quality or scarce wetland communities such as calcareous fens and floodplain forests, and managing them to preserve a diversity of species are key aspects of this strategy.

Goal 2 Performance Measure: Monitoring and Assessment

Development of Wetland Assessment Methods: Level 1, 2, 3 Approach

The Wetland Team is developing a wetland assessment and monitoring program following the general Level 1, 2, 3 approach endorsed by the USEPA Workgroup. This approach is designed to maximize efficient use of scarce resources for wetland monitoring while gathering scientifically valid information that addresses the needs of managers. Level 1 is Landscape Assessment relying on coarse, landscape scale inventory information, typically gathered through remote sensing and preferably stored in, or convertible to, a geographic information system (GIS) format. Level 2 is Rapid Assessment at the specific wetland site scale, using relatively simple, rapid protocols. Level 2 assessment protocols are to be validated by and calibrated to Level 3 assessments. Level 3 is Intensive Site Assessment using intensive ecological evaluation methodologies, particularly research-derived, multi-metric indices of biological integrity. The Department's strategy is to develop complementary wetland condition assessment tools that can be used across the broad spectrum of wetland types at both the site-specific and landscape scales. Publications describing the methods we have developed are available on the Wetland Assessment and Monitoring web page at: http://dnr.wi.gov/org/water/fhp/wetlands/assessment.

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Level 3 Site Intensive Methods: Wisconsin Floristic Quality Assessment

The Department has adapted the Floristic Quality Assessment methodology for use in Wisconsin plant communities. The final report to EPA, *Development of a Floristic Quality Assessment Methodology for Wisconsin, published* in June 2003, describes the method, its uses and limitations. This method allows for an intensive, expert-based, assessment of the "Floral Diversity" function of a given wetland site. It can also be used to document the biological condition of the wetland, based on its plant community. The method relies on a "coefficient of conservatism" pre-assigned by a group of botanical experts to each native species. The coefficient is assigned on a scale of 0-10, based on the species' likelihood of occurring in an undisturbed plant community.

The method is applied by gathering a complete plant inventory and applying the coefficients to each species occurring on the site. A mean coefficient of conservatism and a floristic quality index can then be calculated for the site. The method requires a high degree of plant identification skill to correctly inventory the site. A computer program to enter plant inventory data and calculate WFQA statistics is now available.

Multi-metric Indices of Biological Integrity for Depressional Wetlands

In 2002, refinement of the depressional wetland biotic index to assess additional metrics was completed. The results are published in *Refinement and Expansion of Wetland Biological Indices for Wisconsin.* Five separate indices were successfully developed that can separate impacted wetlands

from least-impacted reference sites. The successful indices were for plants, macroinvertebrates, diatoms, and amphibians. These metrics can be combined into a composite Index of Ecological Integrity, or applied separately.

Staff training and field testing of the original multi-metric biotic index for depressional wetlands (based on plants and macroinvertebrates) was held in 2002. The final report (2004) will assess the feasibility of implementing this method by existing staff on a routine basis.

Level 1 Landscape Level Method: Using Landsat Imagery to Map Invasive Reed Canary Grass (Phalaris arundinacea): A Landscape Level Wetland Monitoring Methodology

The Department has developed a protocol for mapping the most widespread invasive wetland plant using Landsat satellite imagery. This will provide a coarse-level, first-cut assessment of wetland condition at a landscape scale. The protocol was successful in mapping wetlands heavily dominated by reed canary grass to a ½ acre minimum mapping unit with satisfactory accuracy in a large pilot area (182 km by 182 km) in southern Wisconsin. The final report to USEPA discusses ways of using this data to report on this aspect of wetland condition by watershed. The resulting classification is in GIS format and can be used for a variety of planning and management purposes. The map is being made available on the Department's wetland assessment and monitoring webpage at http://dnr.wi.gov/org/water/fhp/wetlands/assessment.

Integrating Wetlands into the Watershed Approach – Milwaukee Basin Wetlands Assessment

In November of 2001, a two-phase pilot project in the Milwaukee River Basin was started with the goal of developing a process to assess wetland functions on a watershed scale. The project is intended to provide managers and planners with information to set priorities for wetland protection and restoration. The six watersheds of the Milwaukee River Basin have been further subdivided into 58 subwatersheds, allowing for analysis on a variety of scales. This project concentrates on developing Level 1 GIS-based decision support tools to aid planning for wetland protection and restoration. In the coming second phase of the project our existing Level 2 rapid assessment tool will be modified to serve as a check on the results of the decision support tools. We will also develop an assessment method to evaluate the restorability of degraded and former wetlands.

Project staff areutilizing existing GIS information to develop custom data layers for use in the Basin. New data layers have been created to map drainage ditches and wetlands dominated by reed canary grass. A map of potentially restorable wetlands has been produced using soils, wetland inventory and land use data to identify restoration opportunities. The Department is contracting with county land conservation and planning agencies in 2004 and 2005 to intensively ground-truth the potentially restorable wetlands map in selected subwatersheds and further assess the restorability of sites identified on the map. Department staff will ground-truth a stratified random sample of the potentially restorable wetlands that have been mapped across the entire basin.

Expert-derived GIS-based decision tools are used to assess at a coarse level the relative benefits of various restoration opportunities and the relative degree to which existing wetlands provide wildlife habitat, protect water quality in downstream waters and provide water storage to stabilize water flows in the watershed. These tools will be applied by the county cooperators to develop restoration and protection plans for several focus subwatersheds. Site assessment protocols will be developed and implemented by Department and cooperator staff at a select sample of sites to verify the results of the GIS-based assessments and refine the analysis with site level data. County cooperators will report to the Department on the feasibility of using the GIS tools for planning purposes.

Goal 2 Performance Measure: Restoration and Acquisition

Wetland Reserve Program

The Wetland Reserve Program is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. DNR staff

continue to provide assistance to NRCS staff and the public to facilitate implementation of this important wetland program. 4,733 acres of wetlands were restored through the Wetland Reserve Program in 2003 and 8,349 acres were restored in 2004.

WDNR Lake and River Protection Grants

Lake and river grants paid to restore, enhance and acquire wetlands. Three projects received grants solely to restore and enhance wetlands. Wetlands were enhanced through shoreland restoration and land acquisition projects for seventeen other projects.

Goal 3: Streamline DNR regulatory approach for permits and restoration activities in wetlands

Because Wisconsin's regulatory and enforcement program for wetlands is based primarily upon federal laws and regulations, several state and federal agencies are typically involved in every permitting decision. That system often leads to inefficient, inconsistent decision-making, which frustrates wetland owners and doesn't sufficiently protect wetlands. The department can improve the process by identifying and removing barriers to efficient and effective decision-making. The department can also eliminate duplication and provide consistency by establishing a state wetland protection program that supersedes federal regulation and oversight. New legislation authorizing compensatory mitigation and providing state enforcement authority is a necessary part of this regulatory approach. The department can encourage local officials and development interests to avoid wetlands or incorporate them into their project as a site amenity, reducing the need for wetland permits.

Goal 3 Performance Measure: Regulation

A rule to expedite the review and approval for wetland restoration projects went into effect in 2003. To facilitate wetland conservation projects, this new administrative code establishes a streamlined process to review regulated activities associated with the restoration of former wetlands, the enhancement of degraded wetlands and the maintenance or management of existing wetlands.

Wetland Compensatory Mitigation

Rules establishing standards for development, monitoring and long term maintenance of wetland compensatory mitigation projects that are approved by the Department and to establish procedures and standards for the establishment and maintenance of mitigation banks went into effect in 2003. With two years experience with the new program rules, it appears the changes are working as intended. Furthermore, the WDNR and US Army Corps of Engineers, US Environmental Protection Agency and US Fish and Wildlife Service entered into a memorandum of agreement that formally adopts the DNR's guidance document to make decisions between agencies consistent across the state.

Initial results indicate that the wetland compensatory mitigation program has not resulted in any increased review times for wetlands. Also, permitted wetland losses have not increased since the implementation of this new program.

Goal 4: Develop and use modern technology to map, monitor, protect and manage wetlands

Giving the public and staff a common up-to-date source of wetland information to use in making decisions is essential for the preceding strategies to succeed. An integralcomponent of wetland information is the Wisconsin Wetland Inventory, which consists of over 1,700 maps showing the location and types of wetlands in Wisconsin. The cycle for updating inventory information is currently 24 years due to staff shortages and needs to be shortened to make it more useful. Making the wetland inventory available for planning and managing wetlands, in addition to its current use in regulating wetlands, as well as developing a unified tracking and reporting system, are cruicial to the success of this strategy.

Much progress has been made and will continue to be made developing new strategies for

wetland monitoring due to support through the US EPA's State Development Grant Program. New assessment methodologies are described under Reversing the Loss Goal 2.

Goal 4 Performance Measure:Wisconsin Wetland Inventory

The Wisconsin Wetland Inventory continues to improve its new methodology for creating digital orthophotography (aerial photos without distortion). The goal is to eventually have complete state-wide seamless coverage available for downloading from the Internet. In 2004 USEPA funded a digital mapping process for a watershed wetland assessment project in the Lower Chippewa Basin.

Volunteer Monitoring of Purple Loosestrife (Lythrum salicaria) Infestations and Biological Control Effectiveness. A survey protocol has been developed and baseline monitoring has been conducted at *Galerucella* beetle release sites to monitor the effectiveness of the beetles in reducing purple loosestrife populations and documenting the response of native vegetation. The Department has funded a purple loosestrife outreach and management liaison who coordinates education and technical assistance in all aspects of the biocontrol project to teachers, organizations and interested citizens. The coordinator works with the Wisconsin Wetlands Association to offer workshops teaching volunteers to map infestation sites. Follow-up workshops are offered to train volunteers to rear and release beetles and monitor vegetation at release sites. These surveys were conducted in 2002 and 2003. Locational data on infestations are entered into a GIS developed and maintained by the Great Lakes Indian Fish and Wildlife Commission (GLIFWC).

Frog and Toad Survey

The *Wisconsin Frog and Toad Survey* is an on-going survey coordinated by the WDNR. The survey was initiated in 1984 and relies heavily on volunteer efforts. Background information on the survey is included in Mossman and Hine (1985), and the history, analytical techniques, distribution maps, and trend results through 1995 are thoroughly summarized in Mossman, *et al.* (1998). Survey routes are distributed statewide, with a goal of two survey routes in each county. Routes consist of 10 sites that are monitored 3 times annually. Presence/absence of each species is determined for each site based on the breeding calls of male frogs. The relative number of calling individuals at each site ranks the abundance of each species. Survey data are statistically analyzed and a calling index to the route populations is calculated. These route populations are regressed over years to create a species population trend (Dhuey and Hay 1999). While the results cannot be used to monitor the quality of wetlands, it does provide long-term trend data on anuran species over time.